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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/075,330 | 02/14/2002 | Jyhchau Horng | MH-5092 | 8692 |

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Patent Department
Mitsubishi Electric Research Laboratories, Inc.
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Cambridge, MA  02139

| EXAMINER |
|---|
| FILE, ERIN M |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2634 | |

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 10/075,330 | HORNG ET AL. |
| | **Examiner** | **Art Unit** | |
| | Erin M. File | 2634 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on <u>22 August 2005</u>.

2a)☒ This action is **FINAL.**    2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) <u>1-5</u> is/are pending in the application.

     4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1 and 3-5</u> is/are rejected.

7)☒ Claim(s) <u>2</u> is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>14 February 2002</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a)☐ All   b)☐ Some *   c)☐ None of:

       1.☐ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

     * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

### *Response to Arguments*

1.      Applicant's arguments filed August 22, 2005 have been fully considered but they

are not persuasive.  The applicant traverses the rejection of Claims 1-5.  The following

addresses the applicants concerns.


> In contrast, the claimed stores "a training signal received via the channel in a
> circular buffer as a circulating training signal." Note, the singular form "a training
> signal." It would be understood by those of ordinary skill in the art that what is
> claimed is a single training signal is received. Chow repeatedly sends his training
> signal.

The examiner suggests that Chow specifically states in the abstract "repeatedly sending

a training sequence through the channel".  The examiner contends that there is no

significant difference between repeatedly sending a locally stored training signal and

storing a training signal received via the channel in a circular buffer as a circulating

training signal.


> As an advantage, the invention improves the overall performance of adaptive
> equalizers at a reduced complexity and slow convergence rates, particularly
> when a short sequence of symbols is used in the training signal because the
> training signal is circulated. Thus, the invention can be used with equalizers with
> slow convergent rates, and can also be effectively used with other types of
> equalizers with short training signal symbol sequences, see page 3, line 14 et
> seq. Kim does not store a training in a circular buffer. Kim does not minimize a
> mean square error of the training signal. Kim does not compare the mean square
> error with a threshold. Kim does not equalize an input signal if the mean square
> error is less than the threshold. Thus, Kim in combination cannot make the
> invention obvious. Applicant admits that how to compute a mean square error
> (MSE) is known generally. However, the use of the MSE in Kim bears no relation
> to what is claimed or what is described by Kim. Therefore, combining Kim and
> Chow makes no sense.  Kim applies the MSE to an already equalized (filtered)

television signal. What is claimed is minimizing a MSE of a training signal, while estimating the training signal.

Kim does disclose evaluation a mean square error with a predetermined threshold (col. 4, lines 22-23), and if the error is greater than a predetermined error the equalizer develops new coefficients (line 29). The purpose of the Kim reference here is to demonstrate that the use of mean squared error to determine whether a signal is met a threshold, and correcting the signal through equalization if the error is too great. The Kim reference is meant to demonstrate that the use of a mean squared error compared to a threshold to determine whether the error is at an acceptable rate. The examiner contends that Kim does this effectively.

## *Claim Rejections - 35 USC § 103*

2.      The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3.      Claims 1, 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow et al. and in further view of Kim.

**Claim 1**, Chow discloses in the abstract "repeatedly sending a training sequence

through the channel" (emphasis added). There is no significant difference between

repeatedly sending a locally stored training signal and storing a training signal received

via the channel in a circular buffer as a circulating training signal.

This training process is repeated until a predetermined convergence condition is

detected (col. 5, line 60 – col. 6 lines 2). Chow further discloses the equalizer update

method includes the use of a circular buffer for updating equalizer taps (col. 8, lines 51-

66). Chow further discloses that generally this loop is repeated either until the error falls

below a predetermined threshold (col. 7, lines 51-55). Chow fails to use mean square

error estimation in his invention. However, Chow does use the less computationally

efficient method of least mean square (LMS) error estimation. Kim discloses an

equalization apparatus in which a mean squared error estimation is used (col. 4, lines

20-24). Because a mean squared error estimation is more computationally efficient

than least mean squares estimation it would have been obvious to one skilled in the art

a the time of invention to incorporate Kim's mean squared error estimation method into

Chow's invention.


**Claim 3**, inherits the limitations of Claim 1. Chow further discloses a loop that is

repeated either until the error falls below a predetermined threshold (col. 7, lines 51-53).

Chow fails to disclose that the threshold is a target mean square error, as Chow uses a

least mean squares error estimate, however, Kim uses a least mean squares error

estimation technique, the motivation for this substitution is included in Claim 1 above.

**Claim 4**, contains the limitations of Claim 1.  Further, Chow fails to disclose a switch

controlled by the circulation trigger which switches from feeding the training signal to the

equalization and decision device during training stages and feeding the input signal to

the equalization and decision device during an equalization stage.   However, Kim

discloses an equalizer adaptation method in which two memories are used, a first

memory, (fig. 1, 21) and a second memory (25), in combination with a multiplexer (23),

and a mode selection circuit (26).  Kim's apparatus stores in the first memory predicted

filtered data samples for the equalizer in the form of a lookup table (col. 3, lines 32-47).

In the second memory values from the actual received data error is stored (col. 3 line 63

– col. 4, line 4).  The mode selection circuit (26) chooses between the memory values

which will be used for the equalizer coefficients and inputs that the decision to the

multiplexer (23) based upon whether mean squared error is below a threshold value

(col. 4, lines 30-37).  This method of using training signals until a steady state is realized

would be obvious to incorporate into Chow's invention because Chow discusses using

the circular training signals until a threshold of convergence is reached.  Therefore it

would be obvious to one skilled in the art at the time of invention to incorporate Kim's

selection method into Chow's apparatus.

**Claim 5**, inherits the limitations of claim 4. As discussed in Claims 1 and 3, Chow

discloses means for determining if the mean square error is greater than a

predetermined threshold, and minimizing the mean square error of the circulating

training signal and the estimate of the training signal until the mean square error is less

than the predetermined threshold. Further, Kim's discloses using the input signal and

not the training signal to equalize the signal if the mean squared error is below a

specific threshold as discussed in Claim 4.


### *Allowable Subject Matter*


4.     Claim 2 is objected to as being dependent upon a rejected base claim, but would

be allowable if rewritten in independent form including all of the limitations of the base

claim and any intervening claims.


### *Conclusion*


5.     **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action.  In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.


6.      Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Erin M. File whose telephone number is (571)272-6040.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Stephen Chin can be reached on (571)272-3056.  The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

        Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system.  Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).


Erin M. File

10/06/2005

STEPHEN CHIN
SUPERVISORY PATENT EXAMINE!
TECHNOLOGY CENTER 2600